AFROMASTACEMBELUS SEXDECIMSPINUS, A NEW SPECIES OF MASTACEMBELID SPINY-EEL FROM RAPIDS IN THE CROSS RIVER BASIN, CAMEROON.

by

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ABSTRACT.– A new species, *Afromastacembelus sexdecimspinus* is described from rapids in the Upper Cross River, Cameroon. The phyletic position of this species within the African mastacembelid fauna is revealed by the analysis of osteological and meristic characters. A modified diagnosis of the genus *Afromastacembelus* is given.

RÉSUMÉ.– *Afromastacembelus sexdecimspinus* n. sp. est décrit d'après des spécimens provenant des rapides du cours supérieur de la Cross River au Cameroun. La position phylogénétique de cette nouvelle espèce, au sein des mastacembelidés africains, est déterminée par l'analyse des caractères méristiques et ostéologiques. Une mise au point de la diagnose du genre *Afromastacembelus* est donnée.

Keywords : Mastacembelidae, *Afromastacembelus sexdecimspinus*, new species, Cameroon (United Rep.).

The Cross River and its tributaries in west Cameroon and southeast Nigeria constitute one of the ichthyologically least known of West African coastal drainages. Early collections reported upon by Boulenger were incorporated in his catalogue (1916). They probably include less than half of the fish species which occur there, and little has been reported subsequently (e.g. Holly, 1927 & 1930; Stenholt-Clausen, 1959; Scheel, 1971), particularly from the upper regions. Information on the diverse fish fauna from other parts of Cameroon is more extensive, but largely restricted to coastal regions (Trewavas, 1974; Daget, 1984), crater lakes (Trewavas, 1962), the Sanaga River (Daget, 1979; Daget et Depierre, 1980) and more southerly basins (Pellegrin, 1907; Thys van den Audenaerde, 1966; Daget, 1978 & 1979).

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In 1976 a number of localities in the Cross River Basin in Cameroon were sampled by Roberts. Among the fishes obtained were the freshwater stingray, *Dasyatis garouaensis* (Stauch and Blanche, 1962), previously only known from the Niger basin (Compagno & Roberts, 1984), *Tetraodon pustulatus* Murray, 1863, a brilliantly coloured puffer-fish previously known only from the type specimens collected at Old Calabar, Nigeria, and undescribed species, including the rheophilic cichlid *Gobiocichla trewavasae* (Roberts, 1982) and the mastacembelid described herein.

Like other species in the Cross River they appear to have relatives in the Niger basin, although the new mastacembelid is clearly closely related to a Zairean form as well.

The present authors have been working independently towards a better understanding of the numerous Asian and African mastacembelid species. Roberts approached the problem from the species level (Roberts & Stewart, 1976; Roberts, 1980), while Travers (1984a & b) undertook comparative anatomical investigations and reappraised the major taxa on the basis of numerous characters thought to be of value as indicators of phylogenetic relationships.

Travers' observations indicate that the mastacembeloids, for long thought to be perciform fishes, should be considered part of the Synbranchiformes. This conclusion was independently corroborated by Gosline (1983), however, the phyletic affinities of the expanded Synbranchiformes remain uncertain (Travers, 1984b : 110). The African species placed in *Mastacembelus* are not congeneric with the Asian. A new subfamily (Afromastacembelinae) was created for two endemic African lineages, of which one, *Caecomastacembelus* Poll, 1958 already has been named.

Our new species from the Cross River was originally thought to be a member of this genus and listed in Travers (1984b) : 145 as *Caecomastacembelus* sp. At the same time it was recognized that further study of African interspecific relationships was required before a definite conclusion could be reached. In the light of new evidence revealed by further study of the group, we now consider our new species should be assigned to the mastacembelid genus, *Afromastacembelus* Travers, 1984 rather than *Caecomastacembelus*.

Afromastacembelus Travers, 1984

Type species : *Afromastacembelus tanganicae* (Günther, 1983), by original designation of Travers, 1984b : 145.

Diagnosis : Afromastacembeline fishes (see Travers, 1984b for brief diagnosis) distinguished by a deep body (tapered ventrally and caudally); high median fins of even height; tendency to have more dorsal than anal soft fin rays; marked elongation of snout; often preorbital distance greater than postorbital in adults and jaw cleft anterior to posterior nostril which lies posterior to the maxillary coronoid process; preopercular-retroarticular ligament below centre of eye; 10-12 principal caudal fin rays; low predorsal vertebrae number (4-7), accompanied by anterior origin of first dorsal spine (dorsal to pectoral fin when layed against lateral wall of body).

18 species (including 4 which await description); two distinct complexes recognized. Distributed in basins from the Senegal River, through West Africa to the Zaïre basin, inclusive of Lake Tanganyika. Several species in addition to the new one described here are reallocated from a previous incorrect generic placement (Travers, 1984b : 145).

Afromastacembelus sexdecimspinus sp. nov.

Holotype : CAS 51558 (Fig. 1), 149 mm, from high gradient rapids along forest tributary off mainstream Cross River at Bamenda-Memfe road near Widekum, Federal Republic of Cameroon; 17th March 1980.

Paratypes : Five specimens collected at same locality as holotype, include; CAS 51559, 2ex., 95 & 156 mm, BMNH 1985.10.4: 1 & 2, 2 ex., 91.8 & 99.7 mm (former used to prepare Alizarin Red/Alcian Blue transparency) and MRAC 84-04-P-1, 95.3 mm.

Two specimens collected from rapids in mainstream of Cross River 5 to 15 Km downtream from Mamfe, Federal Republic of Cameroon, 1st to 5th March 1980, include; CAS 51560, 1 ex., 83.9 mm and MNHN 1986-0396, 1 ex., 77.2 mm.

Diagnosis : *A. sexdecimspinus* differs from all other African mastacembelids in having 15-16 dorsal spines (Fig. 2), an anterior extension of 18-20 dorsal soft fin rays beyond the most anterior anal element and abdominal/caudal vertebral junction, and the penultimate dorsal and anal spine supporting vertebrae separated by 9-10 elements, see Table I. In addition to this character complex, the following

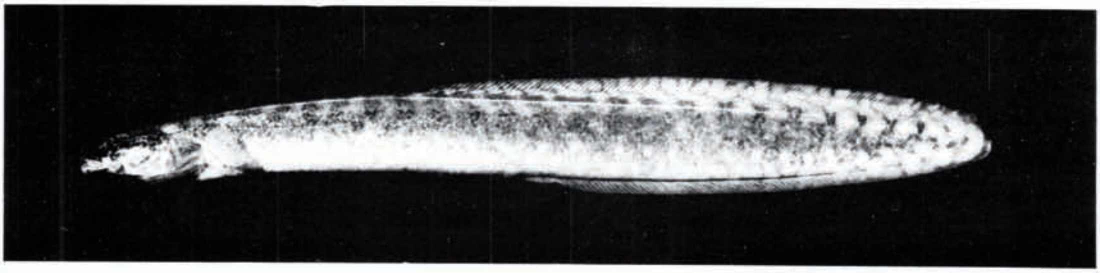

Fig. 1.– Holotype of *Afromastacembelus sexdecimspinus* n. sp. CAS 51558; 149 mm.

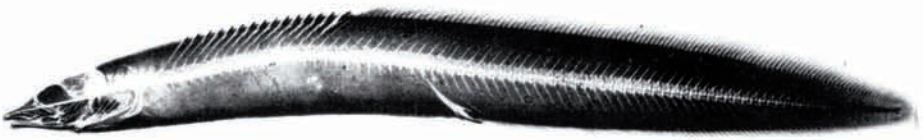

Fig. 2.– *Afromastacembelus sexdecimspinus* radiograph of holotype CAS 51558; 149 mm.

features have been shown to be of value in revealing the phylogenetic relationships of *A. sexdecimspinus* to other closely related species or groups of species at several hierarchical levels within the genus : anterior tip of prootic connected to ventral edge of pedical on frontal (see Travers, 1984a, fig. 36 for illustrations of neurocranium); no toothplate on hypobranchial 3 (Fig. 3); gill slit open to top or just below top of pectoral fin base. The four features that confirm the inclusion of *A. sexdecimspinus* in the Afromastacembelinae include the lack of an ascending process on the urohyal or any direct articulation between it and basibranchial 1 (Fig. 4);

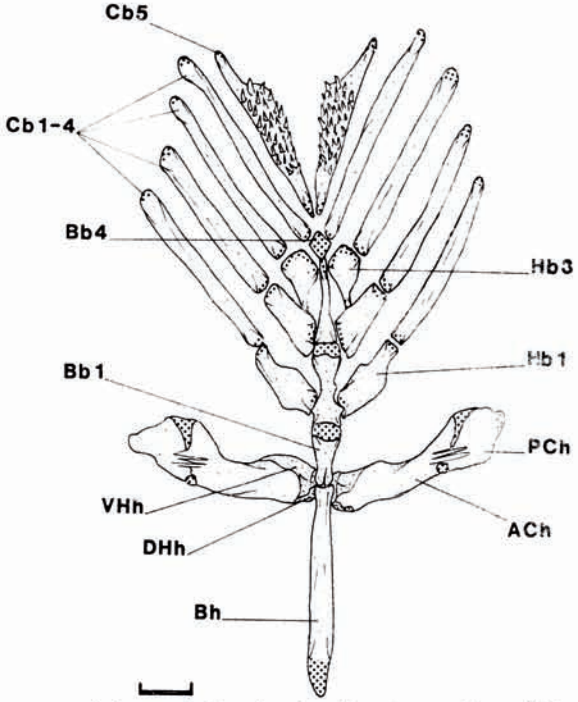

Fig. 3. – ***Afromastacembelus sexdecimspinus*** hyoid and ventral branchial arches, dorsal view (ParatypeBMNH 1985.10.14: 2). A Ch,anterior ceratohyal; Bb1, basibranchial 1; Bb4, basibranchial 4; Bh, basihyal; Cb1-4, ceratobranchial 1-4; Cb5, ceratobranchial 5; DHh, dorsal hypohyal; Hb1, hypobranchial 1; Hb3, hypobranchial 3; PCh' posterior ceratohyal; VHh, ventral hypohyal. Scale on all figures equals 1 mm, even stipple dotting represente cartilage.

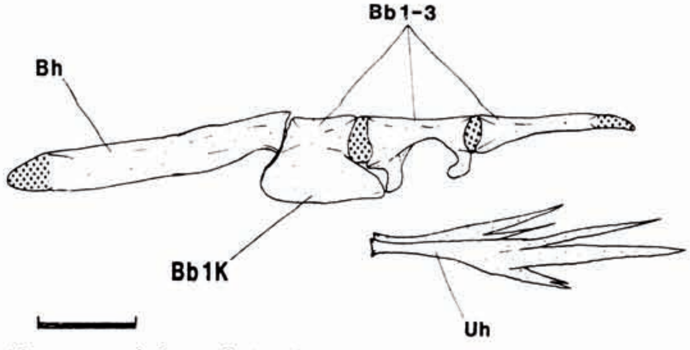

Fig. 4.– ***Afromastacembelus sexdecimspinus*** basihyal and basibranchial elements, left lateral view (Paratype BMNH 1985.10.14:2). Bb1-3, basibranchial 1-3; Bh, basihyal; Uh, urohyal.

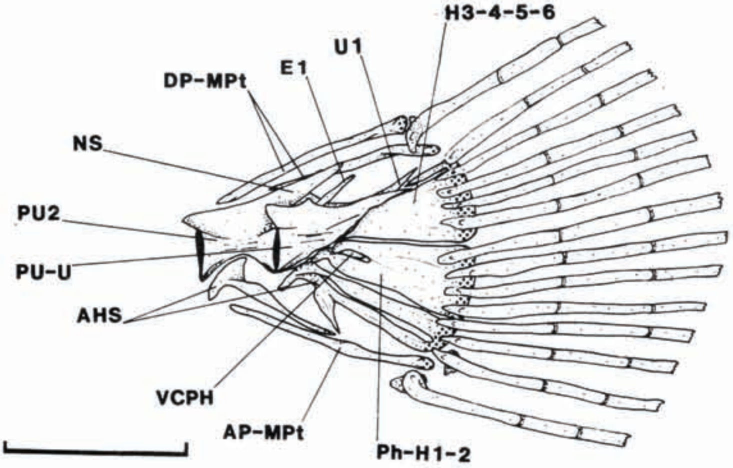

Fig. 5.– *Afromastacembelus sexdecimspinus* caudal fin skeleton, left lateral view (Paratype BMNH 1985.10.14 : 2). AHS, autogenous haemal spine; AP-MPt, Anal proximal and medial pterygiophores; E1, epural 1; H3-4-5-6, fused hypural element 3, 4, 5 and 6; NS, neural spine; Ph-H1-2, fused parhypural, hypural 1 and hypural 2; PU2, 2nd preural vertebra; PU-U, preural plus ural vertebra; U1, uroneural 1; VCPH, vascular canal in parhypural head.

caudal exceed abdominal vertebrae by up to, or more than, 20 elements (Travers, 1984a : table V and Table I herein); scapular foramen not completely bone enclosed (see Travers, 1984a : fig. 70); caudal skeleton composed of 2 hypural plates, parhypural fused to hypural 1 and 10 or 11 principal fin rays (Fig. 5).

Meristic characters : Dorsal fin spines 15 (in 3 specimens) or 16 (5), anal fin spines 3 (in dorsal and anal series of spines, last element always small, hidden beneath skin); dorsal fin rays 112-125; anal fin rays 81-89; pectoral fin rays 24-26; caudal fin rays 10-11 (4-5 upper plus 5-6 lower); predorsal vertebrae 6 (7) or 7 (1); abdominal vertebrae 32 (4) or 31 (3); caudal vertebrae 53 (1), 54 (1), 55 (3) or 56 (3); total vertebrae 85 (1), 86 (4), 87 (2), 88 (1); vertebrae between penultimate dorsal and anal spine supporting elements 10; preopercular spines 2; scales in longitudinal series just below lateral line about 300; scales between origin of soft anal and dorsal fins about 48; scales between lateral line and origin of soft dorsal fin 28.

Morphometric measurements : Head 5.6-6.5 in SL; body depth 10.6-11.9 in SL; eye 7.1-7.9 in head; snout 3.4-3.8 in head (postorbital distance greater than preorbital); pre-anal distance greater than post-anal distance; first dorsal spine 1/2 head length from head (i.e. 6-7 predorsal vertebrae); rostral appendage 1/2 in diameter of eye.

Coloration : Two lateral rows of poorly defined but regularly repeated speckled blotches. The upper series (best observed from dorsal view) includes 20-25 blotches, the most posterior 17-20 extending as smaller marks on the base of the dorsal fin. In some smaller specimens these marks are well defined and separate from a thin, dark, continuous, longitudinal, distal band. In large specimens they are more complex, forming a delicate reticular pattern of two off-set rows of circular marks, the upper of which incorporates and obliterates the subdistal longitudinal band. The pattern of blotches and reticular markings of the 149 mm holotype (Fig. 1) is representative of that in the six largest specimens. In the largest paratype, 156 mm, the blotches and reticulations are particularly well defined, and the reticulations form two rows of off-set, oval or circular markings. In all of our specimens the abdomen is covered with numerous small round pale spots of irregular size. The anal fin has basal and reticular marks similar but less well defined than those on the dorsal fin, and lacks a subdistal longitudinal band.

In the two smallest specimens (from the Cross mainstream below Mamfe) the sides of the body are nearly uniformly dark and the upper series of dorsal blotches barely visible in dorsal view. The patterns on the dorsal fin are well defined, forming solid dark marks in the 149 mm specimen, and a row of near perfect circular marks in the 156 mm specimen.

In life the background or darker coloration on the body and fins was grey in five of the six larger specimens. The sixth specimen was overall reddish in life, with the colour patterns poorly defined (91.8 mm specimen cleared and stained for skeletal study). In the two largest, the lighter areas on the dorsal and anal fins and round spots on the abdomen were yellow; in the other specimens the round spots on the abdomen were also yellow but the light areas on the fins merely pale or colourless. Colour in life was not observed in the two small paratypes from the Cross mainstream below Mamfe.

Ecology : All our specimens were caught in a region of rapids. These consisted of a swift current of crystal clear water flowing over a predominently rock, stone or gravel substrate with small areas of coarse yellow sand.

Etymology : The latin *sexdecimspinus* refers to the number of dorsal fin spines found in the majority of our type-specimens..

Relationships : Our new species is clearly distinguished from all other *Afromastacembelus* by the number of dorsal spines and length of its soft dorsal fin. The posterior loss of dorsal spines and concomitant anterior extension of the soft rayed part of the fin, beyond the abdominal/caudal vertebral junction (Travers, 1984a : 110 & our Fig. 1), is not unique to *A. sexdecimspinus.* It is also present to some extent in *A. sanagali* (Thys van den Audenaerde, 1972), found in the Sanaga River, *A. nigromarginatus* (Boulenger, 1898), occurring in Atlantic basins from the Cavally River, of Liberia and Ivory Coast, eastwards, possibly as far as the Quémé River in Benin, and northwards to Niger River localities and *A. paucispinis* (Boulenger, 1899), occurring in the basin of the Zaïre River (Fig. 6).

The arrangement of the dorsal fin in each of these species is reflected in the number of abdominal vertebrae between their penultimate dorsal and anal spine supporting pterygiophores (e.g. see Fig. 2), and may independently be associated with

Table I. — Meristic characters for *Afromastacembelus sexdecimspinus* n. sp. and three closely related species.

Species and locality	Dorsal spines	Dorsal rays	Anal rays	Dorsal rays in excess of anal	Caudal rays	Predorsal vert.	Abdominal vert.	Caudal vert.	Vert. between penultimate dorsal & anal spine supporting pterygiophores	Total vert.	Catalogue number and type status
A. paucispinis											
L. Zaire R.											
Matadi	8(1)	117	78	39	12(1)	4(1)	28(1)	52(1)	16(1)	80(1)	MRAC 55 Holotype
Inga	9(1)10(1)11(2)	107-123	72-83	35-43	10(1)11(2)12(1)	4(2)5(2)	28(2)29(2)	52(1)53(2)54(1)	12(1)13(1)14(1)15(1)	81(2)82(2)	BMNH 1976.5.21: 199-123
Kotto R.	10(1)	115	81	34	11(1)	4(1)	28(1)	51(1)	15(1)	79(1)	MCZ 48415 (1 of 11 unident. specimens)
Aquarium import	8(1)9(2)	126-127	83-90	36-44	10(2)11(1)	4(3)	28(3)	53(2)54(1)	15(2)16(1)	81(2)82(1)	MNHN 1985-881
A. sexdecimspinus n.sp.											
Cross R.	16	114	88	26	10	6	36	55	10	86	CAS 51558 Holotype
(tributary and mainstream)	15(3)16(4)	112-125	81-89	26-36	10(3)11(3)	6(6)7(1)	31(4)32(3)	53(1)54(1)55(2)56(3)	10(2)11(5)	85(1)86(3)87(2)88(1)	CAS 51559 Paratypes CAS 51560 Paratype MNHN 1986-0396 Paratype BMNH 1985.10.14 : 1-2 Paratypes MRAC 84.04. P-1 Paratype
A. sanagali											
Sanaga R.	25(2)	91-95	79-87	8-12	13(2)	6(2)	32(1)33(1)	54(1)55(1)	1(1)2(1)	87(2)	MRAC 178715 Holotype & 178716 Paratype
Sanaga & Ndjim R.	25(1)26(1)	100	83-89	11-17	11(1)12(1)	6(2)	33(2)	52(2)	2(2)	85(2)	MNHN 1978-729 & 730
A. nigromarginatus											
Togo											
Kara R.	29(2)30(3)	87-90	77-86	2-13	10(5)	5(3)6(2)	38(4)	53(3)55(1)56(1)	3(5)	91(2)93(1)94(1)	MNHN 1982-1248
Oti R.	28(1)29(3)	90-96	84-87	6-12	10(2)	5(2)6(2)	36(1)37(2) 38(1)	55(2)56(1)	2(2)3(2)	91(1)92(1)94(1)	MNHN 1982-1249
Ghana											
Wawa R.	29(1)	93	83	10	10(1)	5(1)	37(1)	53(1)	3(1)	90(1)	MNHN 1984-575
O fin R.	30(2)31(1)	88-98	78-88	10-13	10(3)	5(3)	38(1)39(3)	56(2)57(1)	4(3)	94(1)95(1)96(1)	MNHN 1984-574
Pra R.	30(1)31(3)	95-104	87-93	7-11	10(4)	4(1)5(3)	38(1)39(2) 40(1)	54(1)55(2)56(1)	2(2)3(1)	92(1)94(2)96(1)	BMNH 1934.8.31 : 240-242 MCZ 48082
« Asiantee »	29(1)	92	83	9	10(1)	5(1)	38(1)	56(1)	3 (1)	94(1)	BMNH 1899.10.26 : 5 Holotype
Mali											
Wandiaka R.	27(1)	88	77	11	10(1)	5(1)	35(1)	56(1)	3(1)	91(1)	MNHN 1978-161
Ivory Coast											
Sassandra R.	27(1)28(4)	84-94	74-87	7-11	10(5)	6(3)7(2)	37(4)38(1)	54(1)56(1)57(2) 58(1)	4(5)	92(1)93(1)94(2)95(1)	NMB 4492-6
Cavally R.	26(1)27(2)	88-96	77-83	10-14	10(3)	6(1)7(2)	36(1)38(2)	54(2)56(1)	4(1)5(2)	90(1)92(1)94(1)	MNHN 1979-139

Frequencies are given in brackets for all counts apart from the holotype of our new species and the dorsal and anal soft fin rays; a range of values is given for these elements.

MRAC Musée royal d'Afrique centrale ; BMNH British Museum (Natural History); MCZ Museum of Comparative Zoology; MNHN Muséum national d'Histoire naturelle; CAS California Academy of Sciences; NMB Naturhistorishes Museum Basel.

a decrease in number of total abdominal vertebrae (Table I). The unique development of dorsal fin elements (spines and rays) readily separates into states that are specific to each species : the number of vertebrae between their penultimate spine supporting pterygiophores can be used to reflect the stage to which the fin has developed. Travers (1984b : 137-138) described the condition in *A. sexdecimspinus* and *A. paucispinis;* meristic counts for them and the other species are given in Table I. It is tempting to view the transformation from the least derived condition (i.e. *A. nigromarginatus*) through a moderately derived (i.e. *A. sanagali*) to the more derived state (i.e. *A. paucispinis*), as an apomorphy sequence reflecting the close phylogenetic affinities of *A. sexdecimspinus*. Generally the figures for other characters examined (see Table I) support this hypothesis. Clearly the unique dorsal fin can be considered an important synapomorphy of a complex of at least four *Afromastacembelus* species, one of which is *A. sexdecimspinus*. Before our understanding of its interspecific relationships can be further improved, sampling of other isolated westward flowing African basins may be necessary to reveal additional closely related, but as yet undescribed members of this afromastacembeline lineage.

Discussion :

Afromastacembelus sexdecimspinus was included as an undescribed *Caecomastacembelus* in Travers' (1984a : 60) review of the Mastacembeloidei. Further analysis of the African mastacembeloid fauna has revealed that *A. sexdecimspinus* and several other species tentatively considered part of *Caecomastacembelus* (Travers, 1984 b: 145) are, in fact, more closely related to species in their sister genus, *Afromastacembelus*. Consequently, a re-diagnosis of this genus has been made (see p.106), modified from Travers (1984 b).

Analysis of the collections at the BMNH and MRAC suggests other mastacembelid species may occur in the basin of the Cross River. *Caecomastacembelus cryptacanthus* (Günther, 1867) was described from a collection made by Dr. J.A. Smith in « Cameroon Country ». Further information on the locality of this species, the first to be described from Africa, is supplied by the Günther correspondence at the BMNH which reveals « Old Calabar » as the possible type locality. This area is thought likely to be within the drainage basin of the Cross River system. In addition to this species, a single specimen of *Caecomastacembelus loennbergii* (Boulenger, 1898) collected by Stenholt-Clausen in 1957 and deposited at the MRAC, is recorded from the Ikon District « virtually on the boundary between Eastern Nigeria and the British Camroons ». However, he does not report upon this specimen in his published work dealing with his collections from this region (Stenholt-Clausen, 1959).

Our new species is not a close relative of either of these *Caecomastacembelus* taxa; they were considered generically distinct by Travers (1984b : 145). These species are part of a closely related complex that, with the other members of the genus, will be the subject of a forthcoming publication (Travers, *in prep.*).

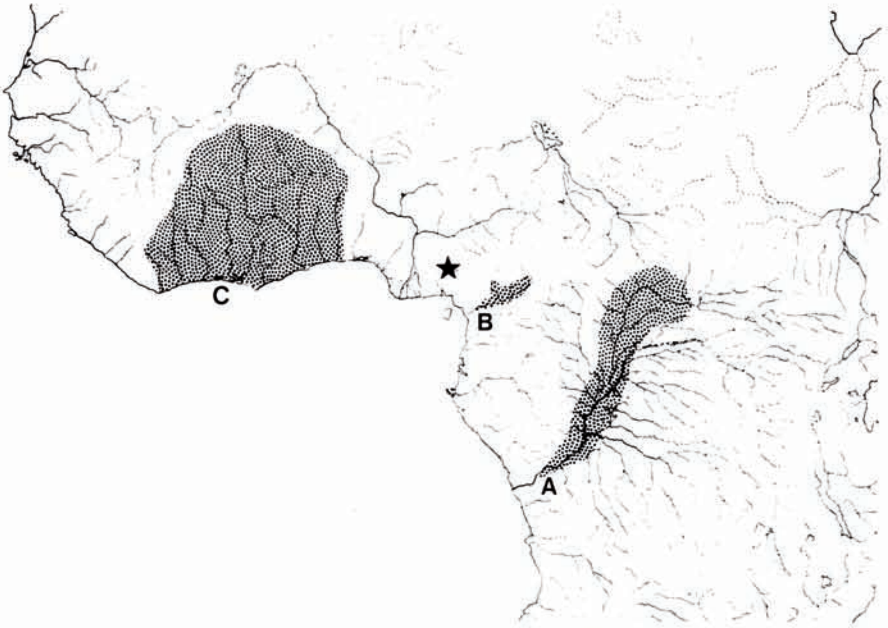

Fig. 6.– Type locality of *Afromastacembelus sexdecimspinus* (*) and known geographical distribution of *A. paucispinus* (A), *A. sanagali* (B) and *A. nigromarginatus* (C) in western Africa.

Afromastacembelus sexdecimspinus relationships lie between *A. paucispinis* and *A. sanagali,* both commonly rapids dwelling forms.

Afromastacembelus paucispinis is a distinctive mastacembelid known from several localities in the Zaire basin (see Table I). The original description of *A. sanagali* was based on only 2 specimens from the Sanaga River (Thys van den Audenaerde, 1972). However, examination of collections at the MNHN reported upon by Daget and Depierre (1980), reveals the specimens identified by them as *Mastacembelus marchei* Sauv. (species 59 in their list) to be *A. sanagali,* and help verify the validity of this species. Whether *A. sexdecimspinus* is confined to the Upper Cross River or occurs beyond this basin, and whether, like its close relatives, it is predominently a rapids dwelling form, are questions that remain to be answered more thorough exploration of the basin.

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